INSTITUTE OF ARCHITECTURE AND CONSTRUCTION OF KAUNAS UNIVERSITY OF TECHNOLOGY

BUILDING PHYSICS LABORATORY

NACIONALINIS AKREDITACIJOS BIURAS
Bandymai / tyrimai ISO/IEC 17025
Nr. LA.01.031

TEST REPORT No. 080-1 SF/25 R
Date: 5^{th} of March 2026

Test methods: **LST EN ISO 22097:2023** Thermal insulation for buildings - Reflective insulation products - Determination of thermal performance.
LST EN 12667:2002 Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance.
Test method – heat flow meter.
Type and identification of apparatus – symmetrical single-specimen apparatus No. 1/99 (ISO 8301).
(number of normative document or test method, description of test procedure, test uncertainty)

Customer: Ropre Lda, Parque Industrial do Conhoso, Rua M, Lote 15, 6200-027 Covilhã, Portugal
(name and address)

Manufacturer: Bolrherm Lda, Parque Industrial do Conhoso, Rua M, Lote 19, 6200-027 Covilhã, Portugal
(name and address)

Samples description: Type 2 multilayer reflective insulation - **Boltherm 235 P IGN V / Boltherm 235 P / Boltherm 235 P IGN / Boltherm 236 P / Ceilingo R'BULL PRO 13**, 600×600mm; Declared thickness of product 13±2mm. Product density 60 kg/m^3.
(name, description and identification details of a specimen)

Samples selected: By customer
(who selected/place/date)

Samples delivery date: 07/04/2025

Place of samples conditioning: Building Physics Laboratory, Institute of Architecture and Construction Kaunas University of Technology, Tunelio st. 60, LT 44451 Kaunas, Lithuania
(name and address)

Samples conditioning date: 07/04/2025 **Date of testing:** 07/04/2025 –09/04/2025

Production date: no data

Tested at: Building Physics Laboratory IAC KTU
(name and address)

Test results:

Name of the indicator and unit	Test method reference no.	Test result
Declared core thermal resistance of product $R_{D(core)}90/90$, (m^2·K)/W	LST EN ISO 22097:2023	**0.29**
Declared thermal resistance of system with 2 air gaps R_{system} 90/90, (m^2·K)/W		**1.60**

Additional information: Mean ambience temperature 10.00 °C, ambience relative humidity 65.0 %.

Annexes: ***Annex 1.*** Tests results; ***Annex 2.*** Calculation of declared thermal resistance; ***Annex 3.*** Calculation of thermal resistance including associated airspaces; ***Annex 4.*** The parameters of heat flow meter apparatus.

Technical manager: (approves the test results) (signature) J. Ramanauskas (n., surname)

Tested by: (technically responsible for testing) (signature) A. Burlingis (n., surname)

S.P.

Annex 1. ***Tests results:***

Specimen No. 080-1/25

Heat flow direction – horizontal		
Conditioning of sample – Climate chamber 48 h, T = 23±2°C, RH = 50±5 %.		
Testing parameters	**unit**	**Value**
Temperature of hot plate, *T(h)*	°C	20.02
Temperature of cold plate, *T(c)*	°C	0.02
Density of heat flow of hot plate, *q(h)*	W/m²	66.01
Density of heat flow of cold plate, *q(c)*	W/m²	65.75
Mean density of heat flow through the specimen, *q*	W/m²	65.88
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, λ	W/(m·K)	**0.04888**
Uncertainty of the measurement, $\Delta\lambda$	W/(m·K)	± 0.000227
Core thermal resistance, *Rc*	(m²·K)/W	**0.3035**
Uncertainty of the measurement, ΔR	m²·K/W	± 0.0006

Specimen No. 080-2/25

Heat flow direction – horizontal		
Conditioning of sample – Climate chamber 48 h, T = 23±2°C, RH = 50±5 %.		
Testing parameters	**unit**	**Value**
Temperature of hot plate, *T(h)*	°C	20.02
Temperature of cold plate, *T(c)*	°C	0.01
Density of heat flow of hot plate, *q(h)*	W/m²	66.71
Density of heat flow of cold plate, *q(c)*	W/m²	65.29
Mean density of heat flow through the specimen, *q*	W/m²	65.50
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, λ	W/(m·K)	**0.04924**
Uncertainty of the measurement, $\Delta\lambda$	W/(m·K)	± 0.000229
Core thermal resistance, *Rc*	(m²·K)/W	**0.3008**
Uncertainty of the measurement, ΔR	m²·K/W	± 0.0006

Specimen No. 080-3/25

Heat flow direction – horizontal		
Conditioning of sample – Climate chamber 48 h, T = 23±2°C, RH = 50±5 %.		
Testing parameters	**unit**	**Value**
Temperature of hot plate, *T(h)*	°C	20.02
Temperature of cold plate, *T(c)*	°C	0.02
Density of heat flow of hot plate, *q(h)*	W/m²	66.78
Density of heat flow of cold plate, *q(c)*	W/m²	66.46
Mean density of heat flow through the specimen, *q*	W/m²	66.62
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, *λ*	W/(m·K)	**0.04903**
Uncertainty of the measurement, *Δλ*	W/(m·K)	± 0.000229
Core thermal resistance, *Rc*	(m²·K)/W	**0.3002**
Uncertainty of the measurement, *ΔR*	m²·K/W	± 0.0006

Specimen No. 080-4/25

Heat flow direction – horizontal		
Conditioning of sample – Climate chamber 48 h, T = 23±2°C, RH = 50±5 %.		
Testing parameters	**unit**	**Value**
Temperature of hot plate, *T(h)*	°C	20.02
Temperature of cold plate, *T(c)*	°C	0.02
Density of heat flow of hot plate, *q(h)*	W/m²	66.67
Density of heat flow of cold plate, *q(c)*	W/m²	66.29
Mean density of heat flow through the specimen, *q*	W/m²	66.48
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, *λ*	W/(m·K)	**0.04906**
Uncertainty of the measurement, *Δλ*	W/(m·K)	± 0.000229
Core thermal resistance, *Rc*	(m²·K)/W	**0.3009**
Uncertainty of the measurement, *ΔR*	m²·K/W	± 0.0006

Annex 2. ***Calculation of declared thermal resistance***

Sample No.	Core thermal resistance of double sample, Rc	Efective thermal conductivity, λ	Thickness of double sample, mm
1	0,303589	0,04888	14,84
2	0,300763	0,04924	14,81
3	0,300208	0,04903	14,72
4	0,300849	0,04906	14,76
Average:	***0,301352***	***0,04905***	***14,78***

Sample size: 600 x 600 mm.

Declared derived R-value of double insulation product:

$$S_{R(core)} = \sqrt{\frac{\Sigma(R_i - R_{average})^2}{n-1}};$$

$S_{R(core)} = 0.0013219;$

$R_{D(core)90/90} = R_{average} - k_2 \cdot S_{R(core)};$

$k_2 = 3.19$

$R_{D(core)\,90/90} = 0.301252\text{-}3.19*0.0013219 = 0.29\ m^2{\cdot}K/W$

Annex 3. ***Calculation of thermal resistance including associated airspaces according EN 16863 Annex D and EN ISO 6946:***

- Declared emissivity of the product surfaces 0.05;
- Temperature difference across each air cavity of 5K, mean temperature of 10°C;

- Thermal resistance of one air gaps 0.6640 $m^2 \cdot K/W$;
- Thermal resistance of two air gaps 1.3280 $m^2 \cdot K/W$;

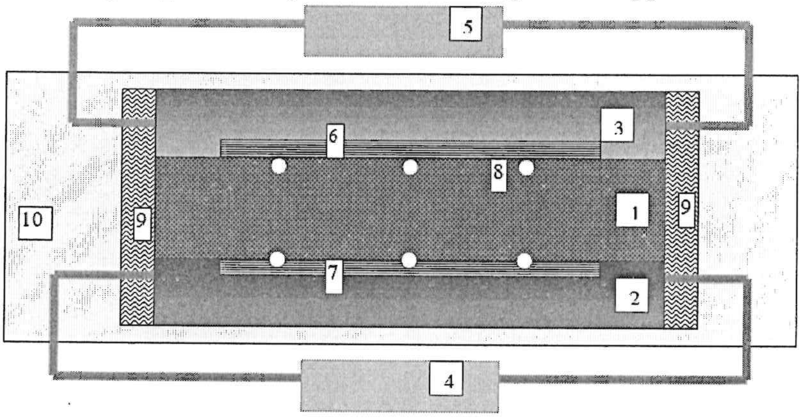
Calculation of thermal resistance including two vertical airspaces:

Air gap 20 mm – Product - Air gap 20 mm

$R_{D(system)\,90/90}$ **= 0.297+1.3280= 1.62386=1.60** $\mathbf{m^2 \cdot K/W}$

Annex 4. ***The parameters of heat flow meter apparatus:***

SCHEME OF HEAT FLOW METER APPARATUS
Single specimen symmetrical configuration apparatus



1 – Specimen under testing;
2 – Cooling plate;
3 – Heating plate;
4 – Cooling thermostat;
5 – Heating thermostat;
6 – Heat flow meter at heating plate;
7 – Heat flow meter at cooling plate;
8 – Thermo-couple;
9 – Guarded space,
10 – Surrounding with controlled constant temperature.

Notes:

- Specimen dimensions 600 x 600 mm, central measuring area of heat flow meter 250 x 250 mm.
- Possibility to measure under various heat flow directions: horizontal, upwards, downwards, on different angles with horizontal plane.
- Used edge heat losses reduction methods:
  - Specimen thickness limitation (to 150 mm);
  - Controlled ambient temperature during the test equal to the mean specimen temperature.